

**Title: Reel Connections****Brief Overview:**

Students will translate real world problems into Algebraic expressions and equations. This unit can be used as a review of Algebra concepts at the end of the year. It begins with translating simple situations and sentences into algebraic expressions. Using a movie theater example (i.e. reel example), they will use their problem solving skills and work in groups to find a solution to the situation. Then they insert variables into equations to find solutions. Finally, students will work with real world problems involving two variables and two equations. They will represent and solve these problems using tables, graphs, and algebra.

**NCTM Content Standard/National Science Education Standard:**

- 1.8.3b Solve linear equations and inequalities in one variable using mathematical properties.
- 1.8.3c Describe real-world situations represented by an algebraic expression or equation.
- 1.12.3e Solve and describe if and where two straight lines intersect using numbers, symbols, and/or graphs.
- 1.12.3f Solve systems of linear equations graphically.

**Grade/Level:**

Grade 8/Algebra

**Duration/Length:**

3 to 5 days - 45 minute periods

**Student Outcomes:**

Students will:

- Translate English words into mathematical expressions and equations
- Solve real world situation using problem solving skills
- Make use of tables, graphs and algebraic expressions to represent and solve a real world situations

**Materials and Resources:**

- Overhead projector
- TI-73 Calculators
- Transparencies

**Development/Procedures:**

Lesson 1: Let's Go To the Movies

**Preassessment** - Students should be able to translate simple English expressions into algebraic expressions. See Worksheet 1A.

**Launch** – Teacher emphasizes the extreme importance of the concept of Algebra as a useful tool for students in their everyday life. A problem involving movie theater attendance is presented and modeled for the students. See Transparency 1B.

**Teacher Facilitation** – A problem is presented about the NBA playoffs. The students represent the information in the problem into a table. The teacher observes the students as they fill in the tables. See Worksheet 1B.

**Student Application** – Students should be able to use the information from the table to create an algebraic equation and to solve the problem. See Worksheet 1B.

**Embedded Assessment** –The teacher carefully observes all of the students working. The teacher asks questions to verify if each student understands the concept of writing algebraic equations.

**Reteaching/Extension** –

For the students who need more of a challenge, they will reteach the lesson to the students who are in need of reteaching. This method has been proven to assist students in comprehending 90% of the lesson.

## Lesson 2: The NBA Playoffs[Game boy]

**Preassessment** – Students should be able to substitute different values into linear equations to find a solution set. See Worksheet 2A.

**Launch** –Teacher will model a familiar situation using Algebra Tiles. (Gameboy example). Teacher will then model how to use the Algebra Tiles to write an algebraic equation and to graph it on a graphing calculator. See Transparency 2A.

**Teacher Facilitation.** – Students use their Algebra Tiles to represent the same situation given a different budget. See worksheet 2c.

**Student Application - -** Students represent another familiar situation using Algebra Tiles. They will then write an algebraic equation and graph it using their graphing calculators. See Worksheet 2D.

**Embedded Assessment** – Students will hand in worksheet 2D accurately representing the problem presented. Completion should confirm their understanding of the three methods used to represent the situation. (i.e. Algebra Tiles, writing equations, and graphing.)

**Reteaching/Extension** – Teacher divides the class into three groups and has them discuss different problems using one of the methods presented.

### Lesson 3: Product Sales

**Preassessment** – Using graphs, students will determine whether a system of linear equations has one, infinite or no solutions. See Worksheet 3A.

**Launch** – Students will analyze graphs to compare the sales of two products over time. See Worksheet 3B.

**Teacher Facilitation** – Students will work in groups to determine the solution to a real world problem using a table. They will then try to represent this solution in graphs and finally in algebraic expressions.

**Student Application** – Students will work in pairs to create their own situation involving two products to compare over time. They will use a graph, a table, and algebraic expressions to represent them and then solve.

**Embedded Assessment** – Teacher observes groups at work, asks questions and verifies student understanding. Teacher will collect partner work and grade.

**Reteaching** – Students practice more analysis of graphs (Preassessment) to determine the number of solutions in a linear system of equations

**Extension** – Students analyze more product graphs (Launch) to answer questions about what they can conclude from the graph

**Summative Assessment:**

The teacher will evaluate the understanding of translating words into algebraic equations and visa versa through the administration of a test. See Summative Assessment.

**Authors:**

Name Carol Collins  
School Universal Ballet Academy  
County/Jurisdiction DC

Name Gladys Okugbeni  
School The Bridges Academy  
County/Jurisdiction DC

## Worksheet 1A

Translate the following phrases into mathematical statements. If no variable name is listed, use an appropriate lowercase letter.

1. the sum of  $x$  and  $y$  \_\_\_\_\_
2. 7 more than  $x$  \_\_\_\_\_
3.  $b$  decreased by 4 \_\_\_\_\_
4. the product of  $x$  and  $y$  \_\_\_\_\_
5. twice the sum \_\_\_\_\_
6. length times width \_\_\_\_\_
7. the ratio of  $a$  and  $b$  \_\_\_\_\_
8. the sum of  $r$ ,  $s$ , and  $t$  \_\_\_\_\_
9. 16 less than the sum \_\_\_\_\_
10. 5 more than the sum \_\_\_\_\_
11. the number that exceeds  $q$  by 9 \_\_\_\_\_
12. the quotient of  $d$  and  $c$  \_\_\_\_\_
13. half the product of the base and height \_\_\_\_\_
14. the average of  $p$  and  $q$  \_\_\_\_\_
15. twice the sum of the length and width \_\_\_\_\_
16. 3 less than the sum of  $y$  and  $z$  \_\_\_\_\_
17. 3 times  $x$  plus 5 times  $y$  \_\_\_\_\_
18. 25 more than one third  $x$  \_\_\_\_\_
19. twice  $c$  increased by 8 \_\_\_\_\_
20. the number that exceeds the difference between  $x$  and  $y$  by 12 \_\_\_\_\_

## Answer Sheet for Worksheet 1A

Translate the following phrases into mathematical statements. If no variable name is listed, use an appropriate lowercase letter.

1. the sum of x and y  $= x + y$
2. 7 more than x  $= x + 7$
3. b decreased by 4  $= b - 4$
4. the product of x and y  $= xy$
5. twice the sum  $= 2x$
6. length times width  $= l * w$
7. the ratio of a and b  $= a/b$
8. the sum of r, s, and t  $= r + s + t$
9. 16 less than the x  $= x - 16$
10. 5 more than the x  $= 5 + x$
11. the number that exceeds q by 9  $= q + 9$
12. the quotient of d and c  $= d/c$
13. half the product of the base and height  $= \frac{1}{2} bh$
14. the average of p and q  $= (p+q)/2$
15. twice the sum of the length and width  $= 2(l+w)$
16. 3 less than the sum of y and z  $= (y+z) - 3$
17. 3 times x plus 5 times y  $= 3x + 5y$
18. 25 more than one third x  $= 25 + \frac{1}{3}x$
19. twice c increased by 8  $= 2c + 8$
20. the number that exceeds the difference between x and y by 12  $= (x-y) + 12$

## Transparency 1A

### Reel Connections

The Collins family is planning to see Finding Nemo in the theater. There are two adults. A daughter in high school and a son in middle school. They have only \$25.00 to spend. Use the following table to answer the questions.

Admission Prices for Finding Nemo		
	Evening	Matinee
Adult	\$7.50	All Seats \$5.00
Student	\$5.00	
Senior Citizen	\$4.00	

1. The movie theater charges the same price for high school and middle school students. Write an algebraic equation to show the cost for the family to see Finding Nemo together.

2. How much will it cost the family to see a Matinee?

3. If the mother decided not to go, how much would it cost the rest of the family to see the movie in the evening?

## Transparency Answers 1A

### Reel Connections

The Collins family is planning to see Finding Nemo in the theater. There are two adults. A daughter in high school and a son in middle school. They have only \$25.00 to spend. Use the following table to answer the questions.

Admission Prices for Finding Nemo		
	Evening	Matinee
Adult	\$7.50	All Seats \$5.00
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Senior Citizen	\$4.00	

1. The movie theater charges the same price for high school and middle school students. Write an algebraic equation to show the cost for the family to see Finding Nemo together.

$A = \text{adult ticket}$

$C = \text{children's ticket}$

$$2a + 2c = \$25.00$$

2. How much will it cost the family to see a Matinee?

$$4m = ?$$

$$4(\$5.00) = \$20.00$$

3. If the mother decided not to go, how much would it cost the rest of the family to see the movie in the evening?

$$A + 2c = ?$$

$$(\$7.50) + 2(\$5.00) = \$17.50$$



## Worksheet 1B

The Okugbeni family is planning to see an NBA playoff final match between the Wizards and the Lakers. There are two adults and four children. They budgeted to spend \$140.00 for tickets. The Stadium charges different amounts for NBA family members. They charge \$35.00 for adult members and \$45.00 for adult non-members. They charge \$22.50 for members who are children and \$35.50 for non-members who are children. Fill in the table below with the given information.

	Members	Non members
Adult		
Children		

1. Write an algebraic equation to show how much it would cost the Okugbeni family to attend one game of the NBA playoffs.
2. Suppose the Okugbeni family is not part of the NBA family. How much would it have cost them to attend the same game?

## Answers to Worksheet 1B

The Okugbeni family is planning to see an NBA playoff final match between the Wizards and the Lakers. There are two adults: two daughters and two sons. They budgeted to spend \$140.00 for tickets. The Stadium charges a different amount for NBA family members. Use the table below.

	Members	Non members
Adult	\$35.00	\$45.00
Children	\$22.50	\$35.50

1. Write an algebraic equation to show how much it would cost the Okugbeni family to attend one game of the NBA playoffs.

$$2a + 4c = \$140.00$$

2. Suppose the Okugbeni family is not part of the NBA family. How much would it have cost them to attend the same game?

$$2(\$45.00) + 4(\$35.50)$$

$$\$90.00 + \$142.00 = \$232.00.$$

## Worksheet 2A

Substitute the values for the first variable in each equation to find the solution set for every problem.

1.  $2x + 4 = y$        $x = \{-2, 0, 2, 4, 8\}$

solution set = {                      }

2.  $5a + 6 = b$        $a = \{-4, -2, 0, 2, 4\}$

solution set = {                      }

3.  $-10h + 8 = I$        $h = \{-6, -3, 0, 3, 6\}$

solution set = {                      }

4.  $-9w - 4 = x$        $w = \{2/3, 8/9, 10/9, 8/18, 4/27\}$

solution set = {                      }

5.  $-6d + 45 = e$        $d = \{-4, -1, 0, 16, 32\}$

solution set = {                      }

## ANSWER SHEET 2A

Substitute the values for the first variable in each equation to find the solution set for every problem.

1.  $2x + 4 = y$        $x = \{-2, 0, 2, 4, 8\}$

solution set =  $\{0, 4, 8, 12, 20\}$

2.  $5a + 6 = b$        $a = \{-4, -2, 0, 2, 4\}$

solution set =  $\{-14, -4, 6, 16, 26\}$

3.  $-10h + 8 = I$        $h = \{-6, -3, 0, 3, 6\}$

solution set =  $\{68, 38, 8, -22, -52\}$

4.  $-9w - 4 = x$        $w = \{2/3, 8/9, 10/9, 8/18, 4/27\}$

solution set =  $\{-10, -12, -14, -8, -2 \frac{2}{3}\}$

5.  $-6d + 45 = e$        $d = \{-4, -1, 0, 16, 32\}$

solution set =  $\{69, 51, 45, -51, -14\}$

## Worksheet 2B

You have a budget of \$280.00 to purchase an Advance SP Gameboy for \$100.00. You want to determine how many game cartridges you can afford given each cartridge costs \$25.00. Will you have any money left over?

Let the flat = \$100.00

Let the rectangle = \$10.00

Let the small square = \$5.00

Gameboy Cost	Budget

## **ANSWER SHEET 2B**

**Step one: Student should know that there are four 25s in 100[ flat tile]**

**Step two :Since there are two 100s,then there are eight 25s in 200.**

**Step three: Students will have to realize that they can't use all ten to get 25,so take two tens[rectangle tiles] and one five[small square]**

**Step four : Six tens[rectangle ] and three fives[small square] will give three 25s.**

**Step five: We are left with only one five. [small square]**

## Worksheet 2C

You have a budget of \$350.00 to purchase an Advance SP Gameboy for \$100.00. You want to determine how many game cartridges you can afford given each cartridge costs \$25.00. Will you have any money left over?

Let the flat = \$100.00

Let the rectangle = \$10.00

Let the small square = \$5.00

Gameboy Cost	Budget

## **ANSWER SHEET 2C**

**Step one: Take three flat tiles represent \$300. There are four \$25 in one flat tile, so there will be twelve \$25 in \$300.**

**Step two: Take four rectangle tiles and two small square**

**Step three: Two rectangle tiles and one small square tile make twenty five.**

**Step four : Since we have four rectangle and two small square tiles ,that give us two twenty five dollars exactly .So there is no money left.**

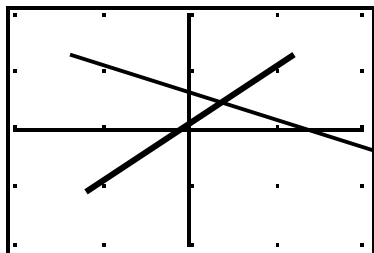


## Worksheet 3A

### System of Equations

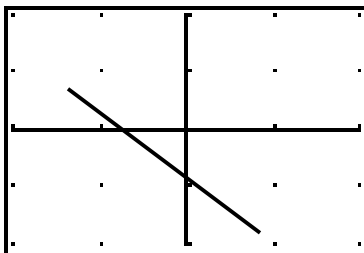
Do the graphs have one, infinite or no solutions?

Intersecting Lines



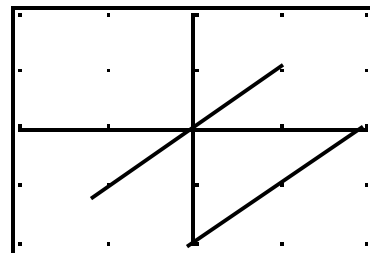
\_\_\_\_\_ solutions

Same Line



\_\_\_\_\_ solutions

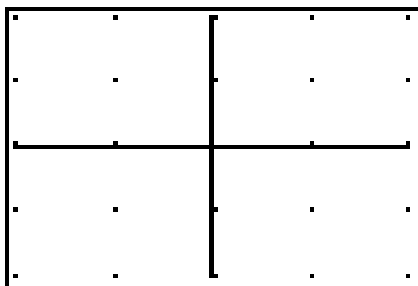
Parallel Lines



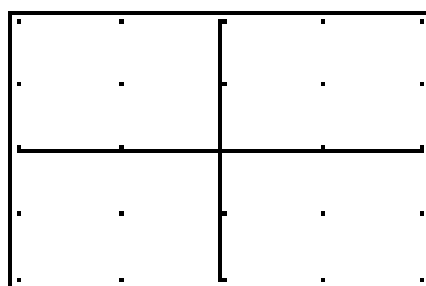
\_\_\_\_\_ solutions

Draw your own system of equations with the following solutions.

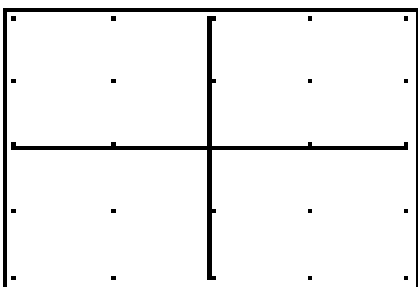
One solution



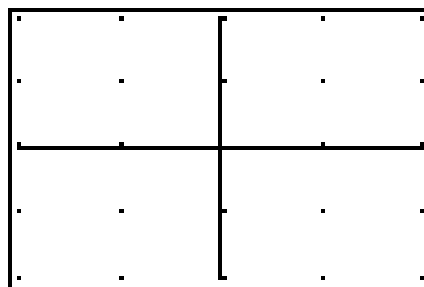
No solution



No Solution



Infinite solutions

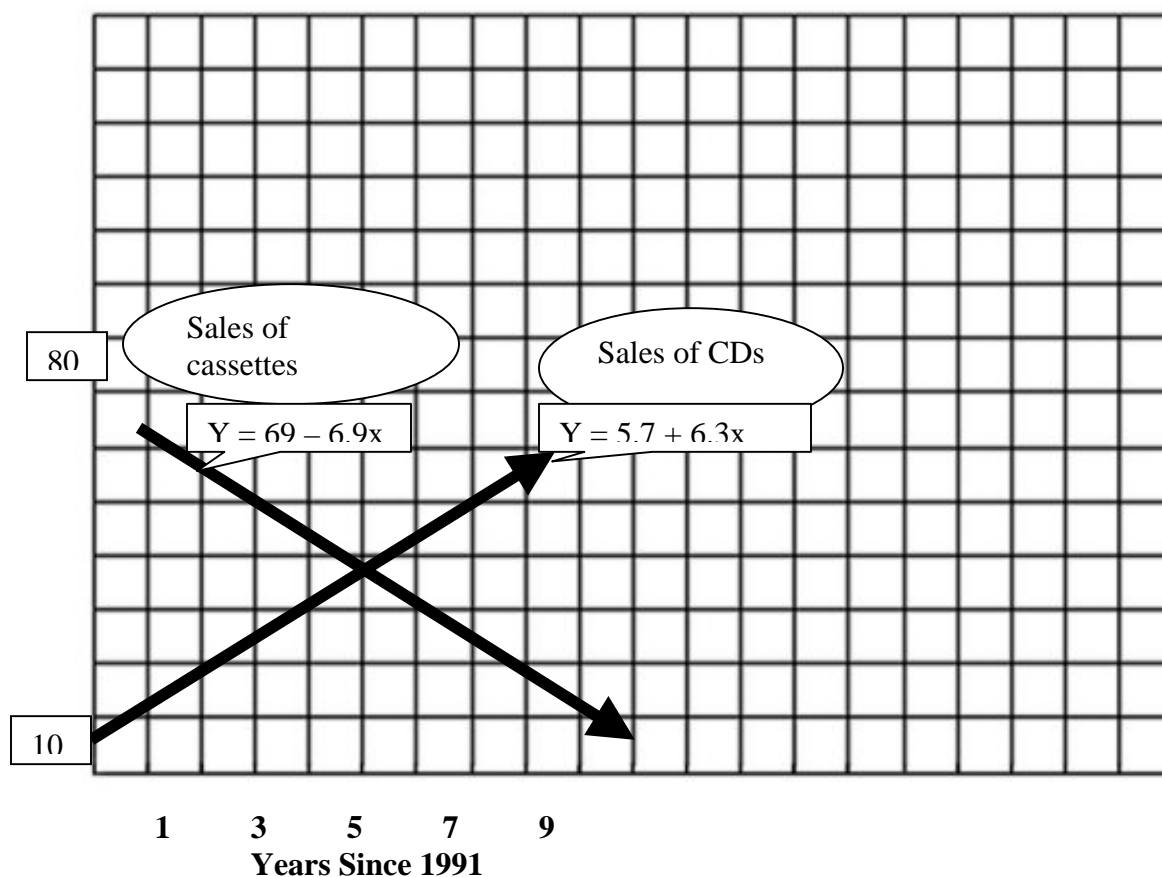


## Worksheet 3B

### Product Sales

Using graphs to compare the sales of two products

#### Cassette and CD Sales Since 1991



**\*\*y axis is Sales in millions of dollars\*\*\***

Cassette sales:  $y = 69 - 6.9x$

CD sales:  $y = 5.7 + 6.3x$

[1] What happened to the sales of cassettes since 1991?

[2] What has happened to the sale of CDs since 1991?

[3] At what point do the two graphs intersect? What does this represent?

### **ANSWER SHEET FOR 3B**

Explanation

[1] The sales of cassettes decreased gradually since 1991 until 1999.

[2] The sales of CD increased considerably since 1991 until the mid 1998.

[3] They intersect in 1995. They both have equal amount of sales in the year 1995.

# Worksheet 3C

## Population Growth

1. In 1990, the population of the Midwest was about 60 million. During the 1990's, the population of this area increased an average of about 0.4 million per year. Write an equation to represent the population of the Midwest for the years since 1990.
2. The population in the West was about 53 million in 1990. The population of this area increased an average of about 1 million per year during the 1990s. Write an equation to represent the population of the West for the years since 1990.
3. Graph both population equations.
4. Assume the rate of growth for both of these areas remains the same. Estimate when the population of the West would be equal to the population of the Midwest.

### **Answer Sheet Worksheet 3C**

1.  $p = 60 + .4t$
2.  $p = 53 + 1t$  or  $p = 53 + t$
- 3.
4. in about 11.7 years or sometime in 2001

## Summative Assessment (Draft)

1. Write each of the following algebraic expressions in words.

a.  $5x + 1$

b.  $5(x+1)$

c.  $3 + 7x$

d.  $(3+x)*7$

2. Translate each into an algebraic expression.

a. Twice the difference of a and 10

b. The sum of x and 3 diminished by 8

Open-ended questions

3. Write a system of equations (algebraically) that has infinitely many solutions

